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HOG CHOLERA PREVENTION AND THE SERUM TREATMENT

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Hog cholera is the most widespread of the acute infectious diseases of domestic animals. It occurs in nearly all sections of California where hogs are raised. Some localities removed from shipping routes are free from the disease, but there are also remote sections where cholera is present. The cause of the disease is an organism so small that it will pass through bacteria-proof filters, and it has therefore been named "*The Filterable Virus of Hog Cholera.*" The disease is contagious only to swine and enters the body usually through the digestive tract. An incubation period of seven to ten days elapses after the virus is ingested before symptoms develop. Hog cholera should be suspected in any herd where some of the hogs lie in the

dark corners, refusing to come out and feed, and, when forced out, arch their backs, have chills, high fever and coughs. A positive diagnosis of cholera is made by examining, for bright red spots, the kidneys, lungs, intestines and inner lining of the bladder of a recently killed, sick hog.

The only protective treatment that will give satisfactory results, if the herd is infected, is anti-hog-cholera serum. Where the serum treatment is not given, all the hogs on the premises may die, the mortality from cholera being 85 to 100 per cent. Prompt use of the serum in an infected herd will save most and possibly all the herd. As a preventive treatment in sound herds, serum will protect every hog against cholera.

HOW HOG CHOLERA REACHES HERDS AND IS SPREAD

Outbreaks of hog cholera may start directly by contact between sick and well hogs, or indirectly by contact with infected material. *The sick hog is the most important factor in the spread of cholera. All the body tissues and the discharges that pass away from the cholera hog contain the virus. The premises where this animal is kept and the cars or wagons in which it is transported become readily contaminated by the discharges. Even before sickness is apparent the hog may be infected and is a dangerous source of disseminating the disease.* Experiments have proved that direct contact with sick hogs will give the disease to susceptible hogs in every case. Our knowledge of the indirect methods of transmission has come from observation of outbreaks of cholera and by correlating this disease with other infectious diseases.

It is generally thought that the virus reaches herds in the following ways: (1) by the introduction of new stock, show animals, or stock loaned for breeding purposes; (2) by the transportation of hogs on infected cars or wagons and through public stock-yards and over highways; (3) by dirt from insanitary, cholera-infected farms, carried on the feet of men and animals and on wagons or farm implements; (4) by streams and irrigation ditches; (5) by animals and birds that feed upon dead hogs; and (6) by feeding uncooked pork trimmings to swine.

Hogs shipped to non-infected territory immediately after the serum and virus treatment may spread the disease. The change of

environment, lack of care, improper feed and hygienic conditions incident to shipping may sufficiently lower the vitality of the animals with the result that some of the hogs break with cholera and serve to scatter infection at the point of destination.

Faulty methods of vaccination and too small a dose of serum may result in heavy losses in herds treated. Before the outbreak is checked cholera may have spread to neighboring herds and to localities previously free from the infection.

GENERAL PREVENTIVE MEASURES

To prevent cholera from spreading and to keep the disease out of the herd, the following suggestions are offered:

Keep the sick hogs isolated and confined.

Locate the pens and feed lots so that the hogs will not have access to irrigation ditches, streams and public highways.

Provide well-water for drinking.

Isolate new stock, returning show animals and returning breeding stock, for at least two weeks and disinfect them by dipping or spraying before quartering with other hogs on the premises. The time consumed in transportation is usually short and cholera does not develop until several days after the arrival of the hogs on the farm. Also, use care in feeding and attending the quarantined hogs to prevent carrying the infection to other pens.

Load and unload all susceptible hogs outside of public stockyards and ship in cleansed and disinfected cars. Hogs may be given the serum alone treatment to protect during shipment.

Avoid visiting the neighbor's hog pen if there is cholera among his hogs, or disinfect the shoes before leaving the infected premises.

Have your stock-buyer disinfect his wagon before driving into your hog lot.

Keep hog pens clean and sanitary so that buzzards, crows and stray dogs will not be attracted to them.

Isolate and retain for later shipment all recently vaccinated hogs until two weeks after treatment, provided that all are free from symptoms of cholera.

Cook before feeding, or discontinue feeding, garbage and pork scraps to hogs unless they are immune to cholera. Recent experiments

have proved that fresh refrigerated pork and, in many cases, salted and smoked hams will produce cholera if fed to susceptible pigs. In the early stages of the disease, carcasses of hogs show no lesions and are passed for meat as apparently healthy. The cholera virus in this meat will survive refrigeration and the curing process in many cases. Pork trimmings usually go into the garbage can uncooked and are often fed with the kitchen scraps to hogs that are unvaccinated. It is evident that an outbreak may start from this practice. Full grown city garbage-fed hogs become immune to cholera as the result of eating pork scraps. Such herds are continually exposed to cholera infection from the feed and, where no vaccination is employed, the losses in weaned pigs often amount to 50 per cent before immunity is established.

CONTROL OF OUTBREAKS OF HOG CHOLERA BY DISINFECTION

During an outbreak of hog cholera the safety of the neighbors' hogs should be considered equally with the infected herd. Disinfection and clean-up measures to destroy the virus should be immediately employed and continued until all evidences of cholera have disappeared. Hogs showing symptoms of disease after vaccination should be confined to a small clean pen that can be kept clean and can be completely disinfected. Dead cholera hogs should be cremated or buried deeply and covered with quicklime. Although the entire herd may be immunized to resist the infection on the premises every effort should be made to destroy the virus as a protection against a recurrence of the disease in the herd when new stock is admitted or more animals added by birth and principally to safeguard the neighbors' herds.

Disinfection of the hog lots and houses depends on the destruction of the cholera virus and the removal and exclusion of carriers. Many old wooden buildings with decayed floors and walls cannot be completely disinfected and may harbor the virus for some time. Sometimes because of poorly constructed houses and of very filthy pens it would be more practical to remove the herd to new quarters on another part of the farm. If this is done the abandoned houses may be removed or may be cleaned thoroughly, disinfected and left exposed to the sun and natural influences for several months to rid them of infection. The hog lots may be freed from infection by placing them

under cultivation for a year. The first step to completely disinfect the premises consists in removing all manure, litter and rubbish. The manure may be mixed with quicklime and used for fertilizer. All litter and rubbish, unsanitary troughs, rotten boards and porous material should be burned. Filth and dirt should be removed from all cracks and crevices and every part of the construction material should be exposed before a disinfectant is used. The cleansing process is just as important as the disinfecting process.

A disinfectant solution may be applied with a large brush, but is more thorough if applied with a force pump in the form of a fine spray. Enough of the solution should be used to thoroughly soak the part covered. The ease with which the hog houses may be disinfected depends on the construction. Cement houses are readily cleaned and disinfected while rough wooden houses require more of the solution and preferably more than one application. Pens containing sick hogs should be sprayed frequently, especially the floors and troughs. After disinfection the troughs should be washed out with clean water before they are used for feed.

The choice of a disinfectant against hog cholera depends on its ability to kill the virus, its power to penetrate construction material and its cost. A very satisfactory disinfectant is compound cresol solution (U. S. P.), used in the proportion of one part of concentrated solution to thirty parts of soft water. Equally efficient substitutes are any of the coal tar disinfectants that are guaranteed to contain 50 per cent of cresylic acid. The latter are used in 3 per cent solution, made by adding four fluid ounces of concentrated disinfectant to one gallon of soft water. Other substitutes sometimes used are, lime, chlorinated lime, carbolic acid, crude carbolic acid, and corrosive sublimate. Lime is a cheap disinfectant and is valuable for frequent spraying of walls, ceilings and fences. It is often sprinkled on the floors of pens. Chlorinated lime is a stronger disinfectant than lime but has an objectionable odor. Carbolic acid is expensive and is not effective against the cholera virus in 3 to 5 per cent solution. Crude carbolic acid varies in effectiveness because its cresol content varies. Corrosive sublimate (mercuric chloride) is one of the strongest disinfectants in the proportion of one ounce to eight gallons of water. It is objectionable because it is poisonous to stock and it corrodes metals.

PREVENTION BY MEANS OF ANTI-HOG-CHOLERA SERUM

Should hog cholera appear in the herd, the only means of protection is inoculating with anti-hog-cholera serum and virus. As soon as a positive diagnosis of cholera has been made the herd should be treated. Vaccination, if employed before the disease progresses, will save all the healthy hogs and a large percentage of those having a rise of temperature. It will not save the visibly sick hogs. Delay in treatment means increased losses by death and increased cost of treatment because more serum will be necessary, and it also multiplies infection, making it harder to clean up and control the spread of the disease in the community.

After treatment the herd should be kept on a light diet and given pure drinking water for a period of two weeks. The pens, sleeping quarters and troughs should be cleansed daily and disinfected immediately after vaccination and twice a week thereafter until all signs of cholera have disappeared. Abscesses and blood poison may develop after vaccination if the hogs are allowed the use of dirty wallows or mud holes and filthy pens. All dead hogs should be burned or buried deeply and covered with quicklime. Hogs which develop a chronic form of the disease should be destroyed. Most of them would die naturally after prolonged suffering. A complete recovery is very unusual and, as a rule, recovered hogs are not worth their feed. Chronic cases are chiefly objectionable because they keep alive the virus of cholera on the premises and as long as the virus is present some agent may pick it up and disseminate it about the neighborhood.

ADDING NEW HOGS TO INFECTED PREMISES

The virus remaining in the soil on an infected farm may be destroyed by natural influences in a short time or it may remain virulent for months. Conditions of soil and climate vary in different parts of the state so that no definite time required to destroy infection can be set to apply to all localities. In general the infection remains a shorter time in summer than in winter. Experiments have shown that the virus in manure and filth is quickly killed, due to putrefaction and fermentation which take place during the warm part of the year. During the cold part of the year the virus will live longer because putrefaction is slower. The virus remaining in the houses, in bedding and troughs, etc., can be destroyed by proper disinfection.

Restocking with non-vaccinated animals as long as there are sick hogs on the premises is unsafe. Three months after the removal of the last sick hog, provided the premises have been completely cleaned and disinfected, they may be considered safe for susceptible hogs. Before that time all susceptible stock introduced should be vaccinated.

METHODS OF USING ANTI-HOG-CHOLERA SERUM

There are two methods of immunizing hogs against cholera. One method consists in injecting serum alone, the other in injecting virus (virulent hog-cholera-producing blood) simultaneously with serum in another part of the body. Serum alone injected into a susceptible hog protects against cholera for a period of three to six weeks. If this hog does not become exposed to cholera within a few weeks following the serum injection the immunity conferred by the serum gradually lessens and the hog again becomes susceptible to cholera. Virus blood taken from a hog acutely sick with hog cholera would kill a susceptible hog if injected alone, but will not if a dose of serum is injected simultaneously, but, on the other hand, will confer on this hog a permanent immunity. In small pigs the immunity is sometimes outgrown and, therefore, is not always permanent.

ADVICE CONCERNING VACCINATION

Vaccination is not advised in any locality unless there is cholera present in the herd, or it is exposed to the infection. General vaccination of all hogs would be a needless expense and might spread cholera in localities free from the disease.

In infected herds the temperatures of all the animals should be taken to ascertain the extent of infection and to guide in the dosage of serum. The temperature will reveal approximately the number of hogs that have cholera and will give some idea of the percentage of losses that may follow. All hogs having a temperature above 104° F. should be regarded as infected and should receive at least a 50 per cent increased dosage of serum. All hogs showing visible cholera symptoms (staggers, pneumonia, paralysis, sore eyes) should not be treated, but should be destroyed, preferably cremated.

The simultaneous method is advised in sick herds on all hogs except sows about to farrow and pigs less than three weeks old. Results in

the field have shown that virus given to hogs with a temperature due to cholera does not influence the course of the disease detrimentally and that recovery is just as frequent as with serum alone. All suckling pigs cannot be permanently immunized, but may safely be given serum alone, or serum and virus. Sows with litters may receive serum and virus provided their pigs are also given serum. Pigs less than three weeks old should receive serum alone and should be revaccinated in four to six weeks later with serum and virus. As a rule, pigs over three weeks old will retain their immunity until they weigh thirty to forty pounds, when they can be revaccinated permanently with serum and virus. Sows may be given the simultaneous treatment safely up to the time of farrowing, but should be handled very carefully to avoid any injury that may result in abortion.

In herds exposed to cholera, but not infected, the temperatures need not be taken except possibly on animals that are in poor condition. The simultaneous method is advised on all except sows about to farrow and suckling pigs less than three weeks old. The latter may receive serum alone or may be left untreated and isolated in pens removed from possibility of infection until such time as they can receive serum and virus. The optimum time to treat pigs is when they weigh forty pounds and sows before they are bred or just after their pigs are weaned. If untreated they should be closely watched for the first signs of cholera.

Pigs from immune mothers are, as a rule, immune to cholera as long as they are nursed. However, they may become infected when a few weeks old. The simultaneous treatment on these pigs gives a shorter immunity than on pigs from non-immune sows.

The serum alone method is employed where an immunity of only a few weeks is desired. Animals shipped from one cholera-free farm to another may be given serum alone to protect them from fatal exposure in infected cars during transportation. This method is also employed on animals before they are sent to shows for exhibition. Fat hogs ready for market in two or three weeks, if exposed to infection, should receive serum alone.

HOW TO VACCINATE

The day before treatment all hogs should be segregated according to size, confined in clean pens, given plenty of water and light feed. If any of the hogs appear sick, separate them from the healthy ones.



EQUIPMENT NECESSARY TO VACCINATE

Figure 1 shows the equipment necessary to vaccinate, arranged in convenient form ready for use. The numbers indicate the following articles: (1) A white enamel tray holding a 35 c.c. and a 45 c.c. serum syringe, a serum filler, a cork-screw and gauze saturated with an antiseptic solution to cover over the end of syringes when not in use. (2) Two clinical thermometers with strings attached. (3) A bottle of serum with cork removed and a filler inserted. (4) A small white enamel tray holding the serum needles. (5) Cotton. (6) A bottle of compound cresol solution. (7) A metal virus syringe case holding the virus needles. (8) A wide-mouthed bottle with iodine and a cotton swab. (9) A note book and pencil. (10) Towels. (11) A white enamel tray containing two 6 c.c. virus syringes and gauze saturated with an antiseptic solution for covering syringes. (12) A bottle of virus. (13) A bucket with a disinfecting solution and brush.

The serum needles should be of different gauges and lengths. For injecting in the axillary space use needles of 16 gauge and $1\frac{1}{4}$ inches long, and for injecting in the neck and flank use needle of 15 gauge and $1\frac{1}{2}$ inches long. For small pigs needles of 18 gauge and 1 inch long are the best.

The virus needles should all be of 18 gauge, but of different length. Needles 1 inch and $1\frac{1}{2}$ inches long are the most desirable.

The serum is sometimes poured into a pint fruit jar or cup with a cover and drawn directly into the syringes. This method admits of contamination unless strict precautions are taken. A better method would be to perforate the cover of the jar or cup and insert a trochar to which the syringe could be attached and filled without the serum being exposed to contamination. Serum may also be drawn directly from the bottle if two needles are inserted through the cork, one needle admitting air, while the serum is drawn through the other.

The animals should not be crowded and overheated, nor should they be vaccinated during the hot part of the day as their temperature at that time is often above normal.

The table or box holding the vaccinating equipment should be placed next to the pen where the work is to be done and may be covered with clean newspapers or cheesecloth. The ground about it should be sprinkled with an antiseptic solution to prevent dust.

A complete vaccinating equipment, packed in a small grip, may be obtained at cost price from the Division of Veterinary Science.

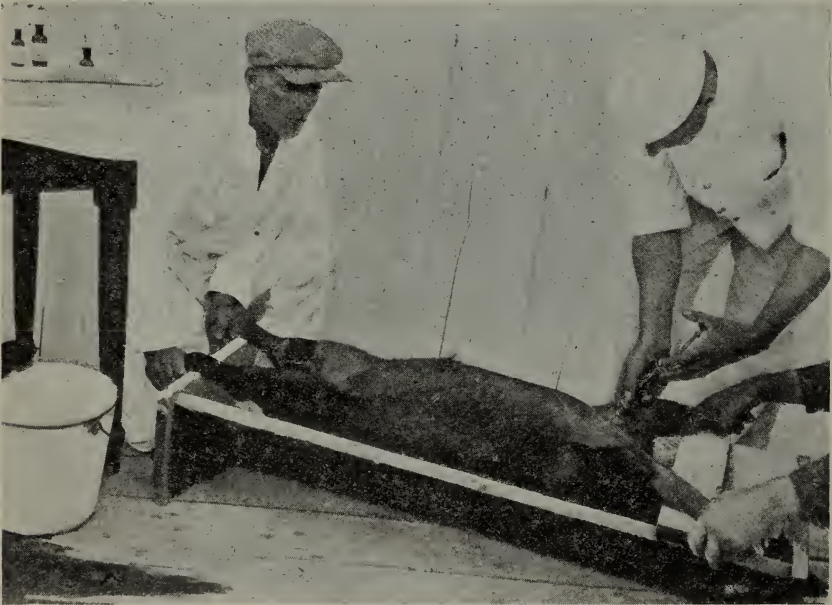


Fig. 2.—Shoats up to 150 pounds are restrained in a wooden V-shaped trough either placed on the ground or with one end elevated. The needle is inserted through the skin and muscle of the armpit, well back from the shoulder and inclined away from the ribs. When the needle is removed there should be no swelling and no serum should leak out. To avoid nerves inject only in the posterior two-thirds of the armpit. More than 20 c.c. of serum should not be injected in one place on large hogs.

The syringes, needles, fillers and glassware used should be sterilized by boiling in water for five minutes. When operating, the extra needles should be kept in a 3 per cent compound cresol solution (one tablespoonful to the pint) and should be changed for each animal. Keep the syringes in trays, covered with gauze saturated in a strong antiseptic solution. The serum syringes and needles should be kept

in separate trays at one end of the table and the virus syringes and needles in trays at the other end of the table.

For disinfecting the skin around the point of injection, 3 per cent compound cresol solution, or tincture of iodine may be used. If the hogs are dirty the skin should first be washed with soap and water, dried and then either painted with iodine or washed with compound cresol solution. Iodine should be applied to the dry skin and is to be preferred for suckling pigs and hogs that are very clean.



Fig. 3.—Suckling pigs are readily vaccinated when held by the front legs, belly forward and the hind legs between the attendant's knees. Serum is injected in the armpits but not more than 15 c.c. should be injected in one place. Too large a dose in one place may fail to become absorbed and may result in an abscess forming. In small pigs a few drops of serum or virus may escape, but this can be prevented by pinching the skin around the puncture after withdrawing the needle. It is a good practise to wipe the point of injection with a cloth rinsed in some disinfecting solution.

Plenty of help should be secured so that it will not be necessary for the operator to handle the hogs. It is necessary, if the work is to be done properly, that he keep his hands clean. Three men can catch and hold the hogs satisfactorily, while a fourth man should be provided to take the temperatures and do the washing. The operator does the injecting and filling of syringes and keeps the record, which

should contain the following: The kind of hog (suckling pig, pregnant or nursing sow, shoat, boar, etc.); temperature, dose of serum and virus, remarks (condition of animal, breed, number, etc.).

The mouth of each serum bottle should be washed in strong disinfectant solution before the cork is removed and the serum filler

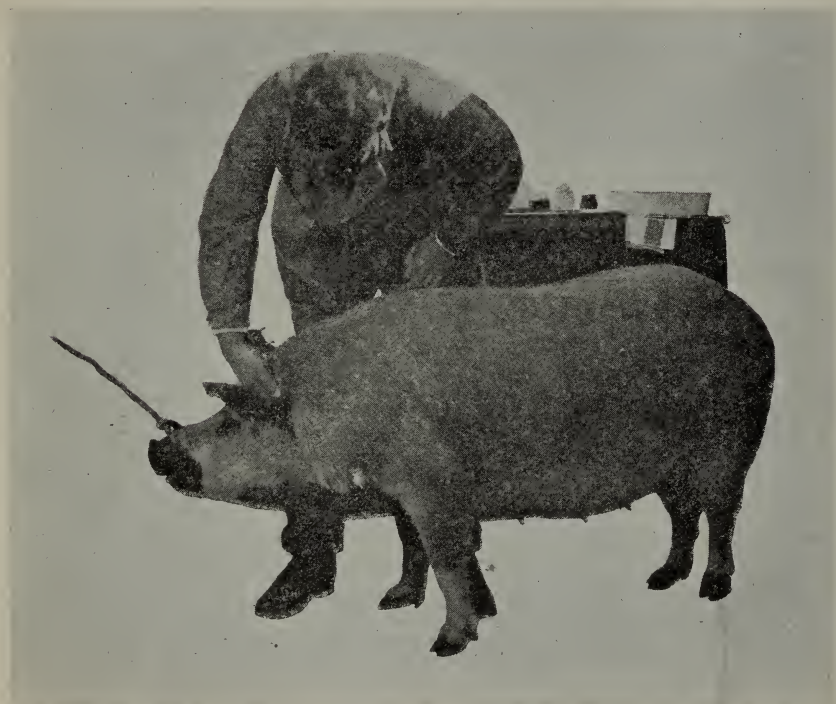


Fig. 4.—Large hogs or sows heavy with pig are vaccinated back of the ear. They may be restrained in a chute or crate or snubbed to a post by passing the loop end of a rope around the upper jaw. To avoid hitting the jowl and salivary gland insert the needle downward and backward toward the shoulder.

inserted. Virus can be drawn directly from the bottle into the syringe without removing the cork. This is done by inserting the needle through the cork, forcing air into the bottle, and then withdrawing the piston.

It does not pay to inject visibly sick hogs. Anti-hog-cholera serum is a preventive and not a cure. In the early stages of disease a large amount of serum can neutralize the virus in the body and aid the

animal's recovery. Some of the visibly sick may get well without serum. In such cases hygienic treatment does more good than serum.

The potency of virus is usually destroyed if it is brought in contact with antiseptics. The antiseptic solution in the needle should, therefore, be shaken out before each injection is made.



Fig. 5.—Virus is injected into the deep muscles of the ham and in another part of the body from that used for serum. To avoid any leakage when removing the needle, inject with the skin tightly drawn so that, when released, it will cover up the needle hole in the muscle. The smallest pig should receive not less than 1 c.c. of virus and the large hog not less than 2 c.c.

All virus left over should be destroyed by heat or by adding to it an equal volume of a strong antiseptic solution.

When ordering or using serum, do not underestimate the weight of the hogs. Plenty of serum should be used. One pig saved by

the liberal use of serum will pay for the increased dosage of an entire herd.

Serum and virus may be spoiled by heat and should be kept away from the rays of the sun at a temperature not above 50 degrees. Where possible during the vaccination of a herd the unopened bottles of serum and virus should be kept in ice water. Metallic cases similar to milk sample collecting cases with a central ice compartment can easily be secured for this purpose.

After treatment the hogs should be given a light feed for a week and should be kept in clean, dry quarters. A small patch of alfalfa is ideal. Dirty wallows and mud holes, streams and irrigation ditches should be avoided. In cold weather avoid exposure to cold and dampness. Hogs readily contract pneumonia and pleurisy after vaccination and bad results may follow the neglect of proper housing.

HOW TO OBTAIN SERUM AND VIRUS

Serum and virus should always be ordered from a laboratory holding a federal or state license. There are several such establishments in this state. The University of California manufactures anti-hog-cholera serum and is authorized by act of legislature to sell it at cost of production to any bona-fide resident of the state who is engaged in hog raising. Virus will be sent for use only by a qualified man and then only in case hog cholera exists in the community, but exception is sometimes made to this rule for the accommodation of breeders of pure-bred immune swine. The present cost of both serum and virus is $1\frac{1}{4}$ cents per cubic centimeter. All serum and virus sent out by the University of California is made under the supervision of the United States Bureau of Animal Industry Inspectors and passes all federal government requirements for potency and purity.

All orders will be shipped C.O.D. unless cash accompanies the order.

Orders may be sent by telephone, telegraph or letter and are promptly filled and shipped.

All communications should be addressed to the Veterinary Division, University of California, Berkeley, California. In the counties having Farm Advisors the serum may be obtained through them.

In order to estimate the amounts of serum or virus needed, when ordering, refer to the tables given in the following facsimiles of labels used by the University of California.

ANTI-HOG-CHOLERA SERUM

FOR THE PREVENTION OF HOG CHOLERA

Before using the serum, read the directions carefully. Keep the serum in a cool, dark place, preferably near ice. Do not inject visibly sick hogs. Increase dosage 50% for hogs having a high temperature.

U. S. VETERINARY LICENSE No. 78

Amount **250 C.C.**

Serial No. _____

Not good after _____

Weight of Hogs	DOSAGE:	Amount of Serum
50 pounds or less	- - - -	30 c.c.
50 to 75 pounds	- - - -	35 c.c.
75 to 100 pounds	- - - -	40 c.c.
100 to 125 pounds	- - - -	45 c.c.
125 to 150 pounds	- - - -	50 c.c.
150 to 200 pounds	- - - -	60 c.c.
200 to 250 pounds	- - - -	70 c.c.
Hogs weighing more than 250 pounds., add 10 c.c. for each 50 pounds weight, maximum 90 c.c.		

Dose thin hogs according to what they should weigh in fair flesh.

Keep at an even temperature from 40° to 50°F.

This Serum is not returnable.

PREPARED BY

AGRICULTURAL EXPERIMENT STATION
UNIVERSITY OF CALIFORNIA
BERKELEY, CALIFORNIA

VIRULENT HOG-CHOLERA VIRUS

DANGER. Not good after _____
This blood will produce hog cholera unless anti-hog-cholera serum is injected at the same time. Read directions carefully before using. Destroy bottle and any remaining contents by fire. This blood cannot be returned for credit.

U. S. VETERINARY LICENSE No. 78

Amount **50 C.C.** DOSAGE: Serial No. _____

Under 50 pounds	- - - -	1 c.c.
50 pounds to 100 pounds	- - - -	1½ c.c.
100 pounds to 300 pounds	- - - -	2 c.c.
Over 300 pounds	- - - -	3 c.c.

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